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	<b>Revision:</b> B	<b>Effective Date:</b> 08 NOV 2013

<b>Approval Block</b>		
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**Historical Reference Section:**

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1. Purpose

This document describes the preparation, use and neutralization for paraformaldehyde decontamination of cleanrooms and laboratory equipment.

2. Scope

This document applies to ATS staff. A customer's written procedure for the use of paraformaldehyde supercedes this document.

3. References

- 3.1 Material Safety Data Sheets (MSDS) for chemicals used.
- 3.2 Personal Protective Equipment (PPE): gloves, respirator, shoe covers, tyvek coverall.
- 3.3 All laboratory personnel must be informed of the plan and schedule to decontaminate the equipment.
- 3.4 Prominent signs (paraformaldehyde disinfection in progress) must be displayed on all personnel entrances to the rooms where equipment is located.

4. Supplies

- 4.1 Electric, single burner hot plate (two each per laboratory unit to be cleaned).
- 4.2 Steel pans (one per hot plate)
- 4.3 Paraformaldehyde
- 4.4 Ammonium Bicarbonate
- 4.5 Clear plastic sheeting
- 4.6 Duct tape – standard grade
- 4.7 Extension cords
- 4.8 Utility knife
- 4.9 Hand tools (screw drivers, allen wrenches, adjustable wrenches)
- 4.10 Wipes
- 4.11 Alcohol

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4.12 Adhesive remover

4.13 Stainless steel polish

### 5. Method Selection Considerations

5.1 This method of disinfection utilizes paraformaldehyde. Paraformaldehyde is one of the most effective disinfectant chemicals (sporicidal, fungicidal, viricidal, bacteriocidal). A gas is formed by heating (evaporating) the paraformaldehyde powder. This toxic gas has the greatest possible penetration into complex structures thereby providing the highest level of disinfectant efficacy. This gas must be contained within a zone or chamber with no direct human contact until the process is complete.

5.2 Due to the health hazard associated with these chemicals, this method is most frequently used to decontaminate equipment although larger areas can be decontaminated.

5.3 Decontamination scheduling:

- Before maintenance work
- Before filter change out
- Before performance tests
- Before moving cabinet to a new location
- Before changing work programs
- After gross spills

### 6. Preparation

6.1 Identify each piece of equipment or room to be decontaminated and post a sign indicating work to be performed. Post the sign on each personnel entry door to the room containing the equipment.

6.2 Ensure there is sufficient access to each piece of equipment.

6.3 Verify that all laboratory materials have been removed from the units. Laboratory equipment may remain in the units if it is not sensitive to heat or corrosion. Remove water pans from incubators.

6.4 Verify that equipment-monitoring alarms have been deactivated (temperature, humidity, CO<sub>2</sub>, exhaust, etc.)

6.5 Turn off any exhaust fans, gas supplies, and lights. Turn off power to control panels on equipment.

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6.6 Refrigerators or freezers must be brought to room temperature prior to decontamination (optimum temperature is 74 degrees Fahrenheit)

7. Sealing Equipment and Chemical Preparation

7.1 Place two electric hot plates inside each piece of equipment. The plate must be on a level surface and have sufficient clearance to prevent damage to the laboratory equipment from the heat of the plate.

7.1.1 The cords for the hot plates should reach outside the equipment or room and past the tape/plastic barrier.

7.1.2 Set the hot plate thermostat to 'medium' (optimum temperature 450 degrees F)

7.2 Calculate the cubic footage of the chamber to be decontaminated for each piece of equipment.

- Square footage of space to be treated = (H) height multiplied by (D) depth multiplied by (W) width. This number is rounded to the next highest whole number.

$$4'4'' \text{ (H)} \times 3' \text{ (D)} \times 6'6'' \text{ (W)} = 84.5 \text{ this rounds up to 85 cubic feet}$$

7.3 Calculate the amount of chemical needed for each piece of equipment. Use of too much paraformaldehyde may result in a white powdery residue.

7.3.1 Paraformaldehyde

- Multiply the cubic footage by 0.3 grams (round to highest 0.25 grams)

$$85 \text{ cu ft} \times 0.3 \text{ grams/cuft} = 25.5 \text{ grams (this rounds to 25.5 grams)}$$

This formula provides a concentration of 0.8% by weight or 10,000 ppm by volume.

7.3.2 Ammonium Bicarbonate

- 110% of the paraformaldehyde as calculated above. (round to highest 0.1 grams)  
25.5 grams x 1.1 = 28.05 grams (this rounds to 28.25 grams)

7.4 Weigh the appropriate amount of chemical for each piece of equipment and dispense into the metal pan. Do not mix the chemicals. Each piece of equipment should have one pan with paraformaldehyde and one pan with ammonium bicarbonate.

7.5 An optimum relative humidity level of 60% is desirable. If the air is dry (40% or less)

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place some water in an empty metal pan and heat to evaporate and raise the humidity level.

- 7.6 All possible escape routes for the paraformaldehyde gas must be sealed.
- 7.7 Using plastic sheet, equipment components, and duct tape, seal all openings. Attempt to enclose as much space as possible. When possible cover the outboard side of and opening allowing the inboard side to be fully decontaminated.
- 7.7.1 Use extra tape along sharp edges that may puncture.
- 7.7.2 Keep the tape flat and neat. Make every attempt to prevent creases. If in doubt retape or add additional tape.
- 7.7.3 Cover all electrical receptacles, gas service, drain holes, etc.
- 7.7.4 Cover the outboard side of all exhaust filters.
- 7.7.5 Hot plate cords or attached extension cords must penetrate the plastic/tape boundary and therefore must be carefully taped to prevent leakage.
- 7.7.6 Incubator glass or plastic door panels can often be sealed in place by taping the edges.

#### 8. Decontamination and Neutralization

Plug in the hot plate with paraformaldehyde. Cook each piece of equipment one at a time. If you cook many units at once, it will be difficult to determine the source of a leak. Do not leave the area unattended.

Allow the paraformaldehyde powder to heat up and evaporate. Check for leaks.

Unplug the hot plate once all the powder has dissipated.

Allow the unit to sit no less than two (2) hours.

After the dwell period is over the decontamination is complete. Begin the neutralization process by plugging in the hot plate with ammonium bicarbonate.

Allow the ammonium bicarbonate powder to heat up and evaporate. Keep the unit sealed of another hour.

#### 9. Cleanup

- 9.1 Carefully remove all plastic and tape from the unit. Use tape remover to remove any remaining adhesive.
- 9.2 Turn on any exhaust fans or recirculating fans to help remove any unpleasant smells.

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9.3 Reactivate all mechanisms or systems.

- Reconnect power supply
- Reactivate power switches and control panels
- Turn on all gas supplies to the unit
- Reactivate any equipment monitoring equipment

9.4 Remove all hot plates, pans and related equipment. Check the inside surfaces of the unit for any white residue. If a residue is present it must be removed by wiping the surface with IPA. Latex gloves must be worn.

9.5 Remove safety signs.

9.6 Record all cleaning activities in appropriate customer cleaning logs and the attached fumigation report.